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Tutorial

Team Collaboration: The Use of Behavior Principles for Serving Students With ASD

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Purpose: Speech-language pathologists (SLPs) and behavior analysts are key members of school-based teams that serve children with autism spectrum disorders (ASD). Behavior analysts approach assessment and intervention through the lens of applied behavior analysis (ABA). ABA-based interventions have been found effective for targeting skills across multiple domains for children with ASD. However, some SLPs may be unfamiliar with the breadth of ABA-based interventions. The intent of this tutorial is to briefly introduce key ABA principles, provide examples of ABA-based interventions used within schools, and identify strategies for successful collaboration between behavior analysts and SLPs.

Method: This tutorial draws from empirical studies of ABA-based interventions for children with ASD within school settings, as well as discussions in the extant literature about the use of behavior principles by SLPs and strategies for interdisciplinary collaboration.

Conclusion: Given the prevalence of ASD at 1 in 68 children (Centers for Disease Control and Prevention, 2014) and the high cost of serving these children within schools (an average cost of 286% over regular education; Chambers, Shkolnik, & Perez, 2003), the need for effective, comprehensive service provision and efficiency within interdisciplinary teams is paramount. Communication, mutual understanding, and recognition of common ground between SLPs and behavior analysts can lead to successful collaboration.

Autism spectrum disorders (ASD) are characterized by impairment in social communication and the presence of repetitive behaviors and restricted interests (American Psychiatric Association, 2013). However, children with ASD vary greatly in symptom severity, presence of intellectual disability, and language deficits, and there are often significant changes in behavioral features within individuals over time (Lord, Leventhal, & Cook, 2001). Additionally, the pervasive nature of the disorder across all areas of development (communication, social, cognitive, play, motor, adaptive skills) means that multiple disciplines are necessarily involved in effective intervention. This can often create challenges in coordinating and implementing services for children with ASD.

Large-scale research in the United States indicates that children with ASD are likely to receive school-based services as a primary intervention service (Mandell, Walrath, Manteuffel, Sgro, & Pinto-Martin, 2005). In a recent study of 101 higher functioning children with ASD, 81% of children were receiving special education services (White, Scahill, Klin, Koenig, & Volkmar, 2007). According to the U.S. Department of Education (2013), over 455,000 students with autism received services during the 2011–2012 school year, making children with ASD the third most frequently served population of children with special education needs that year. Additionally, the American Speech-Language-Hearing Association (ASHA, 2012) reported that 90% of school-based speech-language pathologists (SLPs) reported serving students with ASD in 2012; this reflects an increase of 13% since 2000. Moreover, the number of students with ASD served by school-based SLPs per month has doubled (from four per month in 2000 to eight per month in 2012). No other population of students has grown to this degree during this time period; indeed, several have decreased or remained the same (ASHA, 2012).

The prevalence of ASD continues to rise (one in 68 children and one in 42 boys; Centers for Disease Control and Prevention [CDC], 2014), and the costs for educating children with autism are high. Recent research indicates that the annual costs associated with educating a child with ASD are roughly $6,500 to $10,400 higher than for educating a child without special education needs (Lavelle et al., 2013). These increased costs may be related to the intensity

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of service needs in this population. In order to maximize staffing and the benefit of costly services, school-based teams must carefully coordinate care.

Assessment and intervention methods based on principles of behavior are used widely within school settings. Indeed, applied behavior analysis (ABA) is the lens through which behavior analysts and other team members (including SLPs) target skills for children with ASD. "Applied behavior analysis is a scientific approach for discovering environmental variables that reliably influence socially significant behavior" (Cooper, Heron, & Heward, 2007, p. 15); careful examination of these variables, or intervention methods, through data collection and analysis, determine if one continues an effective intervention or discontinues an ineffective one.

Social communication deficits are a core feature of ASD (APA, 2013). Certified and licensed SLPs, with their specialized background and expertise in social and communication skills, are particularly well qualified to provide services for these students (ASHA, 2006). The training and knowledge of board-certified behavior analysts (BCBAs) also makes them highly qualified to serve children with ASD, particularly for addressing the needs of children with ASD who present with challenging behaviors. In addition, many children with ASD demonstrate improved outcomes across multiple domains when taught within a behavioral framework (National Autism Center, 2011; Z. Warren et al, 2011). Thus, both team members are vital for providing students with ASD comprehensive school-based services.

SLPs and behavior analysts will find that they are often targeting skills within the same developmental domains, even using some of the same strategies, but may be viewing the needs through different lenses. Many SLPs may be employing principles of ABA within their daily clinical practice, yet may not recognize them as such (Ogletree & Oren, 2001). Indeed, the discipline of speech-language pathology has its roots in behavioral principles (e.g., Gray & Ryan, 1973; Hargrave & Swisher, 1975; Mulac & Tomlinson, 1977). However, current practitioners may have limited familiarity with the breadth of intervention methods that are based on ABA, from very structured to naturalistic. Thus, increased understanding is warranted to promote successful coordination and collaboration.

Given these issues, the overarching purpose of this tutorial is to further acquaint SLPs with core ABA principles and ABA-specific practices, to increase understanding and communication with behavior analyst colleagues. Specifically, we (a) briefly introduce key ABA principles; (b) provide examples of both structured and naturalistic evidence-based interventions based on ABA principles in use within school settings; (c) discuss ABA strategies that are often used by SLPs; and (d) describe ways in which SLPs and behavior analysts might successfully collaborate on school-based intervention teams serving children with ASD.

Introduction to ABA Principles

Applied behavior analysis is a scientific approach to examining behavior (Cooper et al., 2007). Although ABA has been widely applied to intervention for individuals with special needs from its inception (e.g., Bijou, 1970), many everyday interactions and explanations for human behavior are based on these principles (Kearney, 2008; Sidman, 1994). Interventions based on ABA adhere to an *operant model*, which holds that learning is the result of consequences that follow a behavior, and these consequences determine the likelihood of a behavior occurring again in the future (Baer, Wolf, & Risley, 1968). The operant model involves three main parts: (a) an *antecedent,* which is an event or experience that happens before a behavior and occasions or triggers the behavior; (b) a *behavior* or response (or lack of response) from an individual; and (c) a *consequence* that occurs after the behavior, the value of which can increase, decrease, or maintain the behavior in the future. This is called the *three-part contingency* (referred to as "the ABCs of ABA"), and it is the basis for ABA interventions (Skinner, 1968). Within an intervention context, the antecedent is most often the stimulus presented by the clinician with the intent to elicit the target behavior, the behavior is the child's response to the stimulus, and the consequence delivered by the clinician can either *reinforce* (increase), *shape* (modify), or *punish* (decrease) the behavior (Cooper et al., 2007; Kearney, 2008). For a more detailed introduction to the principles of ABA, see Kearney (2008).

Although no one intervention has been identified as the most effective for all children with ASD, strategies based on the principles of ABA have the most empirical support for this population at this time (e.g., Maglione, Gans, Das, Timbie, & Kasari, 2012; National Autism Center, 2009, 2011; Z. Warren et al., 2011). Contrary to popular belief, ABA is not synonymous with one method or technique (e.g., discrete trial training; Lovaas, 1987). ABA-based interventions range from highly structured programs that are conducted in a one-on-one treatment setting to more naturalistic inclusion programs that include typically developing children as models. Some ABA programs are distinguishable by "brand names," such as discrete trial training (DTT) and pivotal response training (PRT; R. L. Koegel, Schreibman, Good, Cerniglia, Murphy, & Koegel, 1989), whereas other programs use the principles of ABA (such as the ABCs) more generally. For a complete review of current evidence-based practices in schools for children with autism, please see National Autism Center (2011).

As indicated, principles of ABA can be applied across a wide continuum of intervention methods, from structured to naturalistic. DTT is one example of a highly structured ABA approach, whereas PRT is one example of a more naturalistic approach. DTT involves multiple or massed trials of the same skill at one time, with complexity systematically increased.

Discrete Trial Training (DTT)

Intervention within a DTT framework most often proceeds as follows:

1. The clinician gains the child's attention;

2. the clinician presents the antecedent (referred to as a discriminative stimulus or S^D) intended to elicit the target behavior;
3. the child responds to the stimulus (behavior);
4. the clinician provides the consequence; and
5. there is a brief pause before introduction of the next trial (referred to as an *intertrial interval*).

Depending upon the accuracy of the behavior, the consequence either reinforces desired behaviors or shapes approximations of desired behaviors using a specific, predetermined error-correction procedure, such as saying, "Try again," or modeling the correct behavior (Smith, Mruzek, Wheat, & Hughes, 2006) and repeating the trial. Within DTT, desired behaviors are often reinforced with a consequence that is not directly related to the behavior, such as an edible or sticker (referred to as an *artificial reinforcer*).

A *preference assessment,* which is a formal, systematic way of gathering information about children's preferred rewards, can be used to choose effective reinforcers. Multiple assessment methods can be used, such as (a) providing forced choices—a systematic method of pairing multiple potential reinforcers in a forced-choice paradigm and rank ordering the items according to the child's choices to determine effective reinforcers; (b) using time-based assessment—the clinician provides an array of potentially reinforcing items and collects data on the amount of time the child spends with each item in a free access situation; and/or (c) interviewing caregivers—using systematic interview protocol, the clinician obtains information about child preferences. (See Cooper et al., 2007, Chapter 11, for more detailed description.)

As an example, when targeting expressive vocabulary using DTT, the activity may present as follows. The child or clinician chooses a reward (often an artificial reinforcer). The clinician gains the child's attention and then presents the child with a picture of a cat and says, "What's that?" (antecedent). The child responds, "Cat" (behavior). The clinician states, "Yes! It's a cat," and gives the child the reinforcer (immediate consequence that reinforces the behavior). If the child does not respond or responds in error, a consequence intended to shape the behavior is presented. For example, if the child does not respond, the clinician may give the child an expectant look and point to the picture. If the child's response is incorrect (e.g., the child says, "Dog"), the clinician may respond with a specific error correction procedure intended to reduce the likelihood of another error (e.g., holding up the picture and modeling, "Cat"). The sequence is repeated with a brief pause (intertrial interval) between each trial. A child who is learning a new skill typically requires use of a continuous reinforcement schedule (e.g., production of one target behavior followed directly by the reinforcer; *1:1 reinforcement schedule*), as described above. As the child's performance improves, the clinician may modify the reinforcement schedule (e.g., production of two target behaviors followed by the reinforcer; *2:1 reinforcement schedule*) and/or use a token system.

A *token economy* system of reinforcement can be very useful in a school environment. In this system, *tokens* (which can be pennies, stickers, or any small item) serve as symbols that may be traded for the chosen/desired reinforcer after successful collection of a predetermined number of tokens. Use of a token economy can be advantageous in teaching a child to complete a series of trials, while delaying reinforcement. It may also be helpful when the child's desired reinforcer is not immediately available, so delayed access is necessary. Tokens can be earned for any number of behaviors, such as a correct trial in the example above, periods of time with desired behavior (e.g., a token is placed in a jar for every 10 min that the child does not call out in class), or for participation (e,g., engaging in a social game). When the child has earned the number of tokens predetermined with the adult, s/he is given access to the preselected reinforcer (delayed consequence).

Once a trial is complete and reinforcement is provided (immediate or a token), data about the trial(s) are documented. A core principle of ABA is data analysis to inform clinical decision making. Therefore, the clinician carefully documents the child's performance and the level of support provided for each trial. This DTT framework may be quite familiar to SLPs who use drill-based learning to target speech sounds and/or specific language behaviors. Indeed, such an approach has a rich history within the discipline of speech-language pathology. See Duchan (2010) for a historical review of SLP practices within school settings.

Pivotal Response Training (PRT)

In contrast to DTT, PRT (L. K. Koegel, Koegel, Harrower, & Carter, 1999; R. L. Koegel et al., 1989) is an example of a naturalistic ABA-based intervention. A variety of naturalistic behavioral interventions grounded in the principles of ABA were developed to address some of the limitations of highly structured approaches such as poor generalization of responding to new stimuli, people, and environments, and limited maintenance of some skills over time (Simpson, 2005). PRT is a multicomponent intervention shown to be effective for improving communication (e.g., R. L. Koegel, Dyer, & Bell, 1987), play (e.g., Stahmer, 1995), joint attention (e.g., Whalen & Schreibman, 2003), social interaction (e.g., R. L. Koegel & Frea, 1993), and speech intelligibility (e.g., R. L. Koegel, Camarata, Koegel, Ben-Tall, & Smith, 1998). PRT has been established as an evidence-based treatment for children with ASD (National Autism Center, 2009, 2011; Z. Warren et al., 2011; Wong et al., 2013). It is based on a series of studies identifying important treatment components and demonstrating their effect on child behavior.

The "pivotal" responses trained in PRT are *motivation, initiation,* and *responsivity to multiple cues* (i.e., increasing breadth of attention). Specific elements include gaining the child's attention, presenting clear and appropriate instructions, interspersing easier tasks (maintenance) with more difficult ones (acquisition), sharing control (including following the child's choice and taking turns), requiring the child to

respond to multiple aspects of the learning environment (e.g., both the color and shape of a puzzle piece), providing contingent consequences, ensuring a direct relationship between the child's response and the reinforcer, and reinforcing attempts at correct responding (Humphries, 2003; R. L. Koegel et al., 1989; Verschuur, Didden, Lang, Sigafoos, & Huskens, 2013).

To provide a direct comparison of naturalistic and highly structured ABA-based methods, the previous example of targeting the expressive vocabulary word *cat* is presented here. Within PRT, the clinician might teach the word *cat* in the context of playing with a set of animal figurines or an animal puzzle, offering the child a choice between the two activities (child choice). If the child chooses the puzzle activity, the clinician holds up the cat puzzle piece and asks, "What's this?" (antecedent). If the student responds, "Cat," the clinician hands the student the cat puzzle piece to put into the puzzle (consequence), and then the clinician takes his/her turn by labeling a piece and placing it in the puzzle (shared control). Note that the consequence of giving the child the cat puzzle piece directly relates to the behavior of saying "cat"; this is referred to as a *natural* or *direct reinforcer.* If the child makes an attempt at correct responding, by approximating the production, the clinician would model the correct production and then follow the same steps to reward the child for the attempt, thereby increasing motivation to respond and shaping the target behavior. If the child responds incorrectly, for example, with "dog," or does not respond to the antecedent, the clinician might say, "Cat. It's a cat," to model the expected behavior, and then withhold giving the puzzle piece to the child. The clinician would then present the antecedent again and reinforce the child's imitation of "cat" or an attempt to do so by giving the child the puzzle piece. If the child seems to be unresponsive due to lack of motivation for the activity the clinician might provide alternative choices that may be more motivating. Within PRT, the clinician would use several examples of cats, such as different cat puzzles, books that contain cats, and cat figurines to ensure the child generalizes the concept of "cat" across different stimuli.

Again, this PRT framework is most likely familiar to SLPs; however, they may recognize it under a different name—*milieu teaching*. Like PRT, naturalistic behavioral intervention methods such as enhanced milieu teaching and prelinguistic milieu teaching combine principles of behavior with a social–pragmatic emphasis on adult responsivity and reciprocity. Milieu teaching methods have been found to be effective for increasing the language skills of young children with ASD (Franco, Davis, & Davis, 2013; Ingersoll, Meyer, Bonter, & Jelinek, 2012; Yoder & Stone, 2006a, 2006b). Additionally, a combination of DTT and milieu teaching/PRT has been found effective for increasing the joint attention skills of children with ASD (e.g., Kasari, Freeman, & Paparella, 2006; Whalen & Schreibman, 2003; see Patten & Watson, 2011, for further information regarding joint attention interventions and the clinical implications for SLPs).

ABA in the Schools

Although the effects of comprehensive ABA-based interventions have been most widely investigated with young children in home-based or research settings (e.g., Dawson et al., 2010; Smith, 1999; Z. Warren et al., 2011), numerous school-based interventions employ principles of ABA. Some specific ABA strategies, such as positive behavioral supports, have been widely implemented in schools over the past several decades (e.g., Neitzel, 2010). Also, researchers have started to examine the effectiveness of comprehensive ABA-based interventions for children with ASD within school settings (e.g., Eikeseth, Smith, Jahr, & Eldevik, 2007; Mandell, Stahmer, Shin, Xie, & Marcus, 2013). Some researchers have worked to adapt previously established ABA-based intervention methods to meet the unique needs of schools.

Comprehensive Behavioral Approaches

The following discussion provides examples of comprehensive school-based interventions based on principles of ABA. The discussion is intended to orient readers to several of the ABA-based interventions that they may encounter within schools. It is not intended to be inclusive of all such interventions, nor an endorsement of any particular method. Although further research is needed to establish the efficacy of these interventions as a comprehensive approach to education for children with ASD, the components within these interventions have been established as evidence-based treatments for children with ASD within schools (National Autism Center, 2011). For further information regarding evidence-based practices for children with ASD, please refer to the *EBP Report* (2014) of the National Professional Development Center on ASD (http://autismpdc.fpg.unc.edu/content/evidence-based-practices).

Classroom Pivotal Response Training (CPRT). CPRT (Stahmer, Suhrheinrich, Reed, Schreibman, & Bolduc, 2011) is a comprehensive school-based intervention for children ages 3–11 years based on PRT that is used by school teams to target skills across developmental domains. The program was developed in collaboration with teachers after research indicated that teachers and other school-based professionals were not using the research-based model PRT (L. K. Koegel et al., 1999) as specified in the original training manual (Stahmer, Collings, & Palinkas, 2005; Stahmer, Suhrheinrich, Reed, & Schreibman, 2012; Suhrheinrich, Stahmer, & Schreibman, 2007).

Because the majority of studies related to PRT have been completed in home-based or research settings, teacher-recommended adaptations to PRT were tested to ensure the intervention would still be effective when adapted for use in a school environment. A new manual was developed to help teachers, SLPs, and other team members use CPRT in classroom and group settings to address school-related goals. Teachers and SLPs wanted these additional materials and examples to help them use CPRT within group activities, address Individualized Education Plan (IEP) goals using

CPRT, and train paraprofessionals in use of the methods. For instance, team members had difficulty implementing turn-taking strategies within school settings. So the CPRT manual provides examples of how to assist students in modeling turn-taking behavior for each other during group activities. In addition, the manual includes a data collection system that ties in with IEP goals and allows for collection of data in both group and individual teaching interactions that was developed with the help of an advisory board of school-based professionals.

Preliminary analysis of student outcomes following implementation of CPRT indicated progress on observational measures of IEP goal attainment and standardized communication assessments. Rates of student engagement (appropriate and on-task behavior) doubled after CPRT (Stahmer et al., 2012).

Although there are no clear data to determine which students will benefit most from methods such as those used in CPRT, early PRT studies suggest that increased toy exploration and approach behaviors may predict a better response to a play-based intervention that requires interaction with toys and an adult, such as CPRT in preschool-age children. In addition, high levels of nonverbal stereotypy and avoidance may predict a slower response to naturalistic strategies and suggest a need for more structured interventions (Schreibman, Stahmer, Bartlett & Dufek, 2009; Sherer & Schreibman, 2005). More recent data have suggested that these behaviors may not be predictive of treatment response in a younger-aged sample of children (age 24–30 months) with ASD (Cunningham, 2007).

Strategies for Teaching Based on Autism Research (STAR). STAR (Arick et al., 2003) is another school-based program for children with ASD in preschool through early elementary school. The STAR program utilizes a number of ABA-based methods, including DTT, PRT, and functional routine (FR) instruction. In this model, DTT is used to teach primarily receptive language and preacademic concepts. PRT is used to teach play skills, social interaction, and spontaneous language concepts, and FR instruction is used to encourage generalization and self-help skills and routines.

Functional routines are events that are predictable, follow a chain of behaviors, and are typically associated with a functional outcome (e.g., using the bathroom, morning arrival to the classroom, etc.). Functional routines are taught in a step-by-step, systematic manner to children with ASD to increase independence for common school and self-care routines (Arick et al., 2003). An example of a functional routine within a classroom might be washing hands in preparation for lunchtime. The hand washing sequence is broken into specific steps: turn on the water, put hands in the water, put soap on hands, rub hands together, turn off the water, get paper towel, dry hands, put paper towel in the garbage. The clinician might provide the child with visual supports for each step, facilitate completion of the task with verbal and nonverbal supports, and reinforce completion of the routine with social praise and access to snack. Teaching of FRs is a great opportunity for collaboration between behavior analysts and SLPs, because BCBAs are specifically trained in task analysis (i.e., identifying task components and breaking complex tasks into discrete steps), and the language expertise of SLPs enables them to determine the appropriate level of instruction (i.e., use of verbal language instructions) and how to best utilize visual supports to increase student understanding.

The STAR program also uses the behavioral strategy of *errorless learning.* Errorless learning (sometimes referred to as *most-to-least prompting*) is an approach to teaching that attempts to minimize errors by the child with ASD (Demchak, 1990; Libby, Weiss, Bancroft, & Ahearn, 2008). This is achieved when the clinician controls the prompt to ensure correct production of the behavior and consequent reinforcement (Leaf, Sheldon, & Sherman, 2010). For example, when targeting identification of body parts, the clinician might say, "Touch your nose," while providing hand-over-hand assistance to the child to touch his nose. When the child does so (even with full assistance), the clinician says, "Yes! You touched your nose" (consequence). The clinician repeats this level of prompting several times before slightly fading the prompt; perhaps, instead of providing full hand-over-hand prompting, the clinician might simply touch the child's elbow as a partial physical prompt while saying, "Touch your nose." Errorless learning may also be familiar to SLPs who serve adults, as it is an oft-used strategy when working with individuals with acquired neurogenic communication disorders (ASHA, 2013; Frattali, 2004).

Arick and colleagues (2003) completed an investigation of the effects of the STAR curriculum with two cohorts of children with ASD ages 2–6 years who were receiving school-based services within the state of Oregon. Across children who presented with varied communication, cognitive, and social skill profiles at baseline, they found overall increases in language, basic academic skills, social skills, adaptive skills, and cognitive skills for both cohorts following at least 2 years of intervention. In addition, parents reported above-average satisfaction with the quality of intervention services their child received. In a more recent randomized trial of STAR in Philadelphia schools, Mandell and colleagues (2013) found that student progress was related to fidelity of implementation; however, this varied greatly across classrooms.

Based on their results, Arick and colleagues (2003) made several recommendations for school-based services for children with ASD, including the use of one-to-one DTT, PRT, and group-based FR teaching; consistent progress measurement through ongoing data collection and assessment; and ongoing service provider training. The Mandell et al. (2013) results also highlight the need for ongoing support for teachers implementing complex strategies in classrooms. Given the increase of push-in services and the important role of collaboration within response to intervention models, SLPs are in an ideal position to support such classroom needs.

Learning Experiences, an Alternative Program for Preschoolers and Their Parents (LEAP). LEAP (Strain & Bovey, 2008) is an inclusion, public school-based program that capitalizes on incidental teaching and uses peer

mediation (described in detail below) to facilitate the social and communication competence of children with ASD. It incorporates a variety of ABA-based teaching approaches, including errorless learning, PRT, picture exchange communication system (also described below; Frost & Bondy, 2002), and positive behavior supports (Strain & Bovey, 2008).

Incidental teaching is a naturalistic behavioral intervention strategy similar to PRT. Incidental teaching was one of the first naturalistic strategies developed first for use with children from impoverished environments (B. M. Hart & Risley, 1982). Incidental teaching involves

1. arranging the environment to elicit communication from the child (e.g., placing preferred materials in sight, but out of reach);
2. waiting for the child to initiate an interaction around an item of interest;
3. the teacher/clinician providing support/cues for more complex communication or language; and
4. reinforcing the child by providing the item of interest (Fenske, Krantz, & McClannahan, 2001; S. F. Warren & Kaiser, 1986).

This is very similar to the procedures described above for PRT in that the clinician follows the child's lead; shapes a specific response; and uses a natural, direct reward to increase that response. However, often the antecedent is primarily environmental, rather than a specific prompt by the clinician, as is often used in PRT. This is due to increased focus on child initiation in incidental teaching procedures.

Positive behavior supports (PBS), or *positive behavior interventions,* refer to the use of systematic strategies to support prosocial behaviors and decrease challenging behaviors. These interventions are often employed on a schoolwide basis (not exclusively with children with ASD). They use a prevention model of providing environmental supports to promote positive behavior, and a data-driven, systematic approach to intervention for challenging behavior (Horner et al., 2005).

Components of PBS that may be effective when serving children with ASD include use of clearly and positively stated classroom/school expectations and rules (including use of visual supports for routines and transitions); reinforcement of positive social behaviors; and systematic, data-driven strategies for responding to challenging behaviors, such as the *functional behavior assessment* (FBA; Carr, 1977; Carr & Durand, 1985). ABA-based tools, such as the FBA, are used to assist teams in determining the function of behaviors, particularly challenging ones, and developing behavior plans to support use of alternative behaviors that enable the child to appropriately express his intent. The process of completing an FBA includes several steps:

1. identifying team members;
2. identifying the challenging behavior;
3. collecting data about the behavior;
4. developing a hypothesis about the function of the behavior;
5. testing the hypothesis; and
6. developing a behavior plan (Neitzel & Bogin, 2008).

SLPs often serve as key members of FBA teams throughout all steps of the process. However, they demonstrate particular expertise in identifying functional communication behaviors to replace challenging ones, and leading teams in developing and implementing behavior plans to teach the replacement communication skill. That is, after identifying the function of a challenging behavior in collaboration with the FBA team, SLPs not only can identify replacement communication behaviors that are within the speech and language developmental levels of the student, but also can guide team members in the level of their instruction when teaching the replacement behavior. See Bopp, Brown, and Mirenda (2004) for further information about the role of SLPs in PBS and, more specifically, as members of an FBA team.

A randomized, controlled trial of LEAP revealed that children in classrooms that received 2 years of training and coaching in the LEAP model achieved greater cognitive, language, and social gains than children in classrooms that received LEAP intervention manuals only with no further training (Strain & Bovey, 2011). In addition, children in the experimental classrooms showed greater improvements in challenging behaviors and autism symptoms, as compared to children in control classrooms. There is currently no evidence regarding differential effects of LEAP based on child characteristics; however, perhaps more importantly from a service provision perspective, the fidelity with which LEAP was implemented predicted child outcomes. That is, school teams required extensive training in the LEAP model in order to implement it with fidelity, and children in classrooms where teams demonstrated the highest levels of fidelity also achieved the best outcomes (Strain & Bovey, 2011). This reinforces the importance of clear, consistent understanding and implementation of intervention strategies across the entire school intervention team. It also illustrates the important role of SLPs in helping other team members effectively use social and communication intervention methods.

ABA-Based Methods Used in Schools

In addition to the more comprehensive behavioral approaches described above that are often used in schools, there are several other methods that are well suited to the expertise of SLPs. In fact, many SLPs are most likely employing these methods, yet some may not recognize them as ABA-based. In contrast to the comprehensive interventions described above, these methods are used most often to target one specific area of need (e.g., communication, social, play, adaptive, etc.). Again, these examples are intended to capture the breadth of ABA methods that are commonly in use within schools and may be of particular interest to SLPs.

Picture Exchange Communication System (PECS). PECS (Frost & Bondy, 2002) is an augmentative and alternative communication system intended to support the functional communication of preverbal or minimally verbal individuals with autism and other communication deficits. PECS is widely implemented by SLPs in schools and other service provision sites. PECS, as used according to the manual, is a communication intervention based on the behavioral principles of B. F. Skinner (1957; Frost & Bondy, 2002). The six phases of PECS are intended to help children progress from requesting (referred to as *manding*) to independent and spontaneous commenting through the use of picture symbols. These phases are as follows:

- Phase I: Learning to Communicate (exchange of single pictures for desired items/activities)
- Phase II: Distance and Persistence (continued use of single pictures with different communication partners and across physical distance)
- Phase III: Picture Discrimination (selection and request of desired object/activity from two or more pictures)
- Phase IV: Sentence Structure (use of "I want" + desired item/activity picture to request—known as a *sentence strip*)
- Phase V: Answering Questions (use of sentence strip to respond to "What do you want?")
- Phase IV: Commenting (use of pictures and sentence strip to comment on environment, feelings, thoughts, etc.)

See Frost and Bondy (2002) for a full description of PECS and implementation procedures for each phase.

PECS has been well researched and has been identified as an evidence-based intervention for increasing the functional communication skills of children with ASD (Wong et al., 2013). PECS has been found to increase requesting, social communication, and speech production, and to decrease challenging behaviors (S. L. Hart & Banda, 2010). As Bondy (2011) reported, significant challenges to successful use of PECS include misunderstanding about its roots in ABA, and lack of adequate training and consistency in implementation. Indeed, Bondy (2011) stated,

> Fundamentally, ABA is often misunderstood. It is therefore not surprising that PECS is often misunderstood as well. From my perspective, many people view ABA programs as solely relying on a discrete-trial approach, in which the teacher and a student sit at a desk and the teacher leads all lessons. (p. 793)

As indicated above, the view of ABA as synonymous with only highly structured approaches such as DTT is incorrect and outdated (Stahmer, 2014). With regard to training and implementation of PECS, clinicians and teachers may stray from the manualized and evidence-based method of introducing PECS and moving a child through the phases. Phase I can be particularly vulnerable to implementation errors, because it requires two intervention team members in order to capitalize on the child's own motivation and initiation. For a child learning use of PECS within Phase I, the clinician first determines what objects may be reinforcing for the child (e.g., highly preferred toy, edible, etc.). The clinician then arranges the environment to include a picture of the highly preferred item (placed in front of the child) and the item itself; the clinician serves as the communication partner, and another team member positioned behind the child serves as the helper/physical prompter. The clinician shows the child the item, but does not say anything. As the child reaches for the item, the clinician opens his/her hand, while at the same time the helper guides (hand over hand) the child from behind to pick up the picture symbol and place it in the communication partner's hand. When the clinician receives the picture, the clinician gives the child the object, labeling it, and the sequence is continued. Neither the clinician nor the helper verbally prompts the child, nor do they give any hand-over-hand prompts before the child demonstrates initiation of a gesture request (reaching for object). The child's reach is interpreted as an initiation to request the object. In this way, PECS capitalizes on a child's natural motivation and initiation (Frost & Bondy, 2002). The use of a second person to provide prompts also reduces the likelihood of later dependence on the communicative partner for prompting.

Another implementation challenge observed when using PECS is confusion regarding when to begin use of PECS. As such, SLPs play a fundamental role on the team by identifying the student's current level of communication skills and thus guiding the team's decision making about when to introduce PECS (or use of another communication method) and when to fade use as the child's verbal language increases. Bondy (2011) stated, "Beginning PECS immediately [after starting intervention] does not interfere or compete with working on vocal production, vocal imitation and blending, and other skills that are necessary to produce functional vocal behavior" (p. 795). Because PECS includes protocol for using spoken language, research indicates that it does not seem to impede the development of spoken language in children with ASD when speech is also reinforced appropriately (Schreibman & Stahmer, 2013). However, many team members may demonstrate confusion about how and when to implement PECS with a nonverbal child.

If the child begins to demonstrate use of spoken language while learning PECS, it is important for SLPs to instruct the team in how to facilitate continued spoken language growth while appropriately reinforcing all methods of the child's communication. A common error in PECS implementation occurs when a child's verbal production is ignored at the insistence of use of the picture symbol. The team should directly reinforce a child's verbal request to promote additional productions. However, the opposite can also be observed. Team members must be careful not to ignore the child's appropriate use of PECS by demanding verbal production in addition to the picture exchange prior to providing the reinforcer. Thus, the SLP plays a leading role in training teams to high fidelity of implementation to avoid

such errors, as well as in modeling reliable implementation of PECS within all school environments. SLPs can also ensure that children with ASD have access to their communication books at all times, not simply during specific high-request activities (e.g., snack time) and that the decision to move to the next phase of PECS is data driven.

In recent studies, authors have compared the use of PECS to naturalistic behavioral strategies for eliciting verbal communication. In general, for young children with ASD who are nonverbal or minimally verbal, using PECS or a naturalistic verbal approach leads to similar levels of spoken language over time (Schreibman & Stahmer, 2013), as well as an increase in joint attention skills (Yoder & Stone, 2006a, 2006b). However, there may be benefits to one or the other based on the child's early joint attention skills. For children who demonstrate joint attention skills prior to intervention, targeting use of verbal communication may result in an increase in initiation of joint attention. For children with more limited joint attention skills prior to intervention, use of PECS may lead to use of more requests and initiation of joint attention (Yoder & Stone, 2006a). In addition, children who began treatment with low object exploration benefited more from the verbal communication intervention, whereas children who began treatment with higher levels of object exploration benefited more from PECS (Yoder & Stone, 2006b). In another similar study, Cunningham (2007) found that toddlers entering treatment with no words were less likely to develop spoken language than those entering with just a few words; however, 80% of these children did develop augmentative communication skills through PECS. Although these findings must be replicated, they provide some preliminary clues regarding when to use PECS or a verbal communication approach with young children who have ASD. However, the two approaches need not be mutually exclusive. That is, use of PECS is often combined with other methods within comprehensive approaches to intervention (e.g., LEAP: Strain & Bovey, 2008; Early Start Denver Model: Rogers & Dawson, 2009).

Verbal behavior. Verbal behavior therapy is based on the principles of ABA and, like PECS, is rooted in the language development theories of B. F. Skinner (1957). In this model, spoken language is viewed as a learned behavior; thus, principles of behavior (antecedent, behavior, consequence; reinforcement; motivation) can be used to teach language. The intervention focuses on teaching children with autism to use language to communicate effectively, rather than teaching only vocabulary, as was the case for very early DTT models.

Of particular interest to SLPs may be an understanding of the terminology used within verbal behavior interventions. They may encounter these terms in their interactions with other professionals and mutual understanding is key. In other words, professionals may be using different words to discuss the same communicative concepts. Skinner described four word types: (a) *mand,* a request; (b) *tact,* a comment used to gain attention or share an experience; (c) *intraverbal,* a response to a question; and (d) *echoic,* a word that is simply repeated. The verbal behavior intervention begins by teaching the child mands for preferred items. The child can use a variety of means, including nonverbal (reaching or pointing) and verbal communication (vocalization, approximation, verbalization), to request and achieve access to the desired object. By accepting approximations of communication behaviors in the beginning of intervention, the child learns communication as a skill. The intent is to gradually increase accuracy to correct production of a verbal request. There is also a systematic progression of moving toward more complex tact and intraverbal skills as children master earlier skills (see Sundberg & Michael, 2001). Verbal behavior, like other interventions based on ABA, focuses on motivation as an important antecedent and tries to use direct reinforcement (rewards that are directly related to the activity) as a tool to increase children's use of skills over time and across environments. Careful assessment guides the teaching of new skills.

The efficacy of verbal behavior interventions has been investigated in many small studies. Although these studies have demonstrated effectiveness in improving communication skills in children with autism (Sundberg & Michael, 2001), additional research is needed to confirm efficacy and examine which children will benefit (National Autism Center, 2009).

Peer-mediated intervention. Speech-language pathologists such as Goldstein and colleagues (Goldstein, Kaczmarek, Pennington, & Shafer, 1992; Goldstein, Schneider, & Thieman, 2007; Goldstein & Wickstrom, 1986) have long advocated use of peer mediation to increase the social communication skills of children with ASD. Peer mediation typically refers to one of two approaches to training peers with the intent of increasing the social communication skills of children with ASD: (a) training peers to increase their initiations and directly teach skills to children with ASD (e.g., Goldstein et al., 1992; Strain & Odom, 1986); or (b) training peers strategies to elicit and facilitate the social and communication skills of children with ASD (e.g., Kuhn, Bodkin, Devlin, & Doggett, 2008).

Peer mediation is a key component of the LEAP program described above and, although it is not in and of itself an ABA method, principles of ABA are well suited to teaching peers behaviors that facilitate the social and communication skills of children with ASD. For example, within the LEAP program (Strain & Bovey, 2011), peers are taught to support the communication of children with autism using modeling and reinforcement and then, in turn, the peers are given supports for presenting antecedents to children with ASD and reinforcing their behaviors. In another example, Pierce and Schreibman (1995, 1997) investigated the use of ABA within peer mediation in a school setting. They trained classroom peers in the use of PRT strategies to promote the social and communication skills of children with autism. The peers were trained in 10 PRT strategies:

1. gaining the child with ASD's attention
2. providing the child with ASD choices to increase motivation

3. engaging in a variety of toys/activities
4. modeling appropriate social behaviors, using a variety of play, social, and language examples
5. reinforcing all communicative and social attempts by the child with ASD
6. encouraging conversation by briefly withholding an object or activity until the child with ASD initiates
7. extending conversation by asking questions and commenting on object/topics of interest to the child with ASD;
8. taking turns during play
9. narrating their own play
10. teaching responsivity to multiple cues by commenting on the properties of object/activities

Peers demonstrated high fidelity in use of the strategies. Children with autism demonstrated increased language and joint attention behaviors. In addition, teachers reported an increase in positive social behavior and an increase in peer-preferred activities (Pierce & Schreibman, 1997).

Training peers in use of PRT strategies is a method that can readily be used by SLPs in schools and other service provision sites to promote the social and communicative growth of children with ASD. In addition, it may be especially important because it is likely that children with ASD, especially in special education settings, have limited opportunities to interact in structured ways with typically developing peers (Stahmer, 2007). Donaldson, Hidde, Mershon, and Sanford (2012) have trained graduate speech-language pathology student clinicians to teach PRT strategies to siblings of children with ASD (sibling mediation). Graduate student clinicians have demonstrated high fidelity of implementation, and sibling dyads have demonstrated improved social communication behaviors and overall social engagement.

Children with ASD who have some awareness of their peers and are not actively avoidant of peers (e.g., they tolerate parallel games) may be good candidates for peer-mediated intervention (Ingersoll, Stahmer, & Schreibman, 2001). However, it is important to be cautious of the notion that children must achieve some social or communicative criteria in order to benefit from facilitated interactions with typical peers. There is no evidence to support "inclusion myths" such as (a) a child with ASD must demonstrate certain readiness skills prior to interaction/inclusion with typical peers; (b) a child with ASD only learns within individual instruction settings; (c) the challenging behavior of a child with ASD is tied directly to the level of stimulation within an inclusive environment (i.e., overstimulation); and (d) severe problem behaviors can only be targeted within restrictive environments (Strain, McGee, & Kohler, 2001; Strain, Schwartz, & Barton, 2011). In fact, in a recent study of children in an urban public school program, more severely impaired children with ASD demonstrated greater benefit from inclusive preschool placements over disability-only placements. Children with limited communication skills, severe social impairments, and lower adaptive skills had greater relative cognitive outcomes than higher functioning children (Nahmias, Kase, & Mandell, 2014). Indeed, use of peer mediation to address core social communication deficits requires daily interaction with typical peers, as well as training of those peers (Strain & Bovey, 2011).

Video modeling. Video modeling is another example of an intervention that has been examined within a behavioral framework to target skills across a variety of areas. This intervention involves the creation of a video of a peer and/or adult demonstrating a discrete skill/target behavior, showing the video to the child with ASD, and then practicing the skill within the same activity demonstrated on the video model. Video modeling has been found effective for increasing social communication, play, and adaptive skills in children with ASD (Shukla-Mehta, Miller, & Callahan, 2010; Wang & Spillane, 2009). For school teams, video modeling is an intervention method that might be combined with other intervention methods to target a range of skills within a school environment. Indeed, Donaldson et al. (2012) combined use of video modeling and sibling mediation to target the social communication skills of a school-age child with ASD. The child with ASD demonstrated increased responsiveness to her sibling, joint engagement, and requests. For more information on use of video modeling within schools for children with ASD, refer to Wilson (2013) and Whalen, Franke, and Lara-Brady (2011).

Common Ground Between SLPs and Behavior Analysts

Speech-language pathologists increase the communication and social skills of children with ASD not only through their direct intervention services, but also through sharing their expertise with behavior analysts and other team members. Conversely, SLPs may improve their use of behavioral strategies and methods, which support their treatment with children with ASD, by working alongside their behavior analyst colleagues.

As indicated throughout this tutorial, SLPs are most likely using some, if not many, ABA principles within their current clinical practice. Recognition of this commonality may be an important step in effectively collaborating with behavior analysts and other team members serving children with ASD. Key behavioral strategies that are often implemented by SLPs in schools include use of clear instructions, attention to motivation, and data collection and analysis representing functional use of skills.

An interesting and often useful self-study for clinicians (both SLPs and behavior analysts) is to video record a portion of an intervention session with a child and then review the video to identify their use of the ABCs of ABA (antecedent, behavior, consequence) and other behavioral principles (e.g., capitalizing on child motivation, providing contingent responses to child behavior). Many SLPs may find that they are already employing ABA principles, and

clinicians from all disciplines can learn ways to improve their skills. In addition, viewing within a team setting offers an opportunity to discuss common approaches and to share effective activities and strategies for targeting social and communication behaviors.

Using Clear Instructions

Clear instruction refers to use of an antecedent that elicits the target behavior; therefore, careful selection of the stimuli and use of developmentally and pragmatically appropriate language are key. When determining whether one is consistently using clear instruction, a video review again may be helpful; if the antecedent is unclear to the clinician, then the behavior expectation was unclear to the child. One common pitfall is the repetition or modification of the antecedent before the child has had the opportunity to demonstrate the behavior. For instance, during a pretend picnic scenario while targeting pronouns, the clinician might give a plate to the child and ask the child to give it to "him" (referring to a boy puppet or doll). However, before the child responds, the clinician might repeat, "Give it to him" or modify, "Here, give the spoon to him." Repetition or modification of the antecedent may cause confusion for the child with ASD, who may require additional processing time to respond.

Ensuring the Effectiveness of the Consequence

Another common pitfall in use of the ABCs relates to delivery of the consequence; the consequence should directly follow the behavior and serve to either reinforce or shape the target behavior. A common error is to place additional demands (antecedents) after the child demonstrates the desired behavior rather than providing an immediate consequence. For example, a child might be learning use of a gesture to greet another person (such as a hand wave). If the child performs the wave, but then is prompted to say the person's name before the communication partner responds to the greeting, the consequence does not directly follow the behavior. By adding an additional antecedent (the prompt to say the person's name) and expecting an additional behavior, it may not be clear to the child that the waving behavior was desired and appropriate. Although responses, such as waving and saying a person's name, can be combined (referred to as *chaining*) to increase the accuracy or complexity of the child's behavior (i.e., shaping the behavior), one should be cautious about adding such expectations prior to the child's mastery of the initial targeted behavior. The SLP can assist the team in determining when the child is reliably demonstrating the communicative intent of greeting across environments and communication partners, and advise the team on the child's readiness to add verbal language to the greeting based on the child's speech and language skill levels.

Another common error is providing a consequence that does not have the strength or value to reinforce or shape the behavior. For example, for a child who is working on following a three-part direction, use of an art activity employing the child's favorite theme and materials may serve as a natural and powerful reinforcer for completion of the three-part task. However, following a three-part direction for completion of an undesired activity or a routine task may require a stronger, perhaps artificial, consequence to reinforce the behavior. For example, if the child who has difficulty transitioning into the classroom is directed to put away his backpack, sit at his desk, and start silent reading, he may need to receive a sticker placed on his "star chart" or some other form of tangible consequence to reinforce the behavior. Again, the SLP can assist the team in determining if the child's behavior is truly a function of the strength of the reinforcer, or if the child's receptive language skills or verbal working memory plays a role in his/her successful performance of the behavior.

Because motivation and consequences are so intertwined, it is important not to use reinforcers past their potency. For example, when a child who has been actively engaged in a bubble-blowing activity with the clinician moves away and starts to seek a different toy, the potency of the bubbles as a reinforcer must be questioned. If the child requires prompts to remain engaged in the activity, the bubbles no longer serve to reinforce the desired behavior.

Varying Task Demands

Another key principle to maintaining motivation is interspersion of skills that are easy and difficult for the child (L. K. Koegel et al., 1999). Expecting a child to constantly perform at maximum level of acquisition not only decreases his/her motivation to participate (thus, increasing the likelihood one will need to use an artificial reinforcer, such as an edible or sticker), but also does not allow the clinician to monitor the maintenance of previously acquired skills (e.g., Dunlap, 1984). There are many creative ways to increase student motivation at the antecedent level through incorporation of preferred materials. For example, using highly preferred toys such as trains to teach counting skills or writing a paragraph about a favorite superhero rather than about summer vacation may be an effective way to maintain student motivation when targeting social and communication skills. Collaboration among team members can help professionals identify motivating materials and activities.

Making Data-Driven Decisions

Data collection and analysis are key components of service provision for both SLPs and behavior analysts. Data not only inform teaching, but also determine effectiveness of intervention (Olswang & Bain, 1994; Dollaghan, 2007). Within ABA, analysis of behavior, as recorded by regular data collection, is used to ensure that one continues interventions that are effective and discontinues methods that are not (Cooper et al., 2007). Behavior analysts have extensive training in repeated measurement of behavior, consistent graphing of data, and regular analysis of progress.

Given the heterogeneous nature of ASD, data collection and analysis ensure that one's teaching aligns with each child's skill profile. Sharing data with other intervention team members allows for analysis of performance across environments and with varied communication partners. Team members can also benefit from sharing data collection and analysis methods across disciplines; determining effective and efficient data collection methods/measures facilitates ease and accuracy of repeated measurement. In addition to day-to-day progress monitoring, data also guide goal development for student Individualized Family Service Plans (IFSPs) and IEPs.

Even within naturalistic interventions, where data collection may be perceived as interfering with the social engagement of the child, data collection and analysis are paramount. As Olswang and Bain (1994) indicated, a clinician need not take data across an entire intervention session, but rather may collect a representative sample. Regularly plotting such data on a graph for analysis is a key premise of ABA and allows intervention teams to quickly determine through visual analysis the effects of different teaching methods and the developmental appropriateness of goal selection.

Given large school-based caseloads, for many clinicians, regular and systematic data collection and analysis (outside of typical IEP procedures) may seem daunting. However, a clear responsibility of evidence-based practice for SLPs is the use of *practice-based evidence* (Lof, 2011), also known as *internal evidence* (Dollaghan, 2007), for intervention planning and progress monitoring. A primary component of practice-based evidence for SLPs is the clinician's systematic and repeated data collection on each student's individual performance. The up-front time and effort may likely result in back-end rewards, as clinicians can quickly discontinue methods that are not effective for a specific student, increasing intervention efficiency. In addition, clear data collection and analysis might be used to support discussions with school administrators with regard to caseload sizes and allocation of resources.

Additional Opportunities for Collaboration

In addition to those strategies previously described, there are many specific areas in which collaboration between SLPs and behavior analysts is necessary when serving children with ASD. Both professionals are often asked to consult with classroom teachers, work with children one-on-one, lead small groups, and conduct assessments to examine current functioning. There is often overlap between skills being addressed or measured by both types of professionals. As such, here are some more specific ideas for collaboration:

Determine the appropriate developmental level for instructions. Given their expertise in language development, SLPs are best equipped to determine the types of instructions (antecedent) a student can understand, as well as communication expectations that the team member should place on the child. Indeed, SLPs are skilled in completing highly detailed and comprehensive assessments of a child's communication skills. For example, a team member with a different background might consider a child either verbal or nonverbal. However, an SLP can discriminate with much greater sensitivity the communicative level of the child (e.g., preintentional behavior, intentional behavior, unconventional presymbolic communication, conventional presymbolic communication, concrete symbol use, abstract symbol use, language use; Rowland, 2009). Thus, coordination across service providers can ensure use of appropriate antecedents to maximize the effectiveness of intervention.

Assist in development of program targets. SLPs can guide the team in determining the types of social and communication goals for a child with ASD to ensure they are developmentally appropriate and that they are targeted in a manner that ensures spontaneous and flexible performance. For example, behavior-based programs often focus on moving to multiple word phrases quickly when a student may not be flexibly or consistently using single words. This may lead to the use of rote phrases that the child does not fully comprehend. Additionally, prompting carrier phrases such as "More X" or "I want X" is common in some types of behavior-based therapy. However, coaching teachers and other team members to use more focused and specific language (e.g., "Throw the ball" or "Blow the bubbles") may increase vocabulary and language flexibility while decreasing overgeneralization of carrier phrases.

Provide consistency in addressing behavioral challenges. Understanding and use of ABA principles can be particularly useful across disciplines by helping team members identify and modify challenging behaviors. A key principle of ABA is to try to determine the intent or function of the behavior in order to appropriately respond in a manner that reinforces new behaviors and provides replacement skills for challenging behaviors.

Positive behavior supports and functional behavior assessments, as described above in the section on the use of LEAP, are often used to address behavioral concerns and develop plans to support use of alternative behaviors to express the child's intent. There are typically four possible functions of challenging behaviors: for attention, for escape/avoidance, for sensory stimulation, or to gain something tangible. The methods used to change a specific behavior will vary based on the specific function of that behavior. For example, if a child is exhibiting aggressive behavior in order to gain something (e.g., a toy car), removing toys and activities during the aggression will likely help to reduce the behavior. However, if the child is engaging in aggressive behavior to escape or avoid a teaching demand, then removing toys and activities may actually increase the behavior as it allows the child to escape the teaching demand.

Thus, a behavior plan would be developed to determine antecedent manipulations (to avoid situations the elicit the challenging behavior), consistent consequences matched to the intent of the behavior, and teaching of a replacement or alternative behavior to express the child's intent. In the example above, this might mean teaching the

child to request either the toy or a break, depending on the intent of the challenging behavior.

Collaboration among team members in development and implementation of behavior plans is particularly important to ensure that the child is not unintentionally reinforced for a challenging behavior. If all adults interacting with a student are consistent in how they respond to specific behavioral challenges, the challenges will likely decrease more quickly. Working with a behavior analyst who is trained to determine the functions of challenging behaviors in various environments and in development of behavior plans will support implementation of the plan across providers and school environments. As indicated above, SLPs often lead the team in determining functional communication that is appropriate to replace challenging behaviors serving a communicative function (Bopp et al., 2004). The replacement behavior must work as well, or better than, the disruptive behavior to be effective.

Without such a systematic and data-driven approach to assessment, and consistent adherence to the subsequent behavior plan, a team member could inadvertently reinforce a challenging behavior rather than decrease it. As such, careful collaboration among team members is needed to both develop the plan for reducing maladaptive behavior as well as monitor the effectiveness of the intervention over time.

Cross train. As aforementioned, SLPs have extensive knowledge about language and social development and disorders that is vital when developing programs for children with ASD and educating other team members. Similarly, the principles of ABA can help enhance speech-language therapy by maximizing motivation and reducing behavioral challenges that interfere with therapy. Training across disciplines is an excellent way to build understanding as well as to enhance intervention effectiveness. Not only can team members provide training to each other, but also within both speech-language pathology and behavior analysis disciplines there are opportunities for further cross teaching and education. ASHA offers many continuing education opportunities focused on ABA-based interventions and methods (e.g., presentations at the Autism: Supporting Social Cognition in Schools online conference: http://www.asha.org/events/autism-conf/), and the Association for Behavior Analysis International (ABAI) provides programming related to social and communication intervention, as well as specific to speech-language pathology (e.g., Speech Pathology and Applied Behavior Analysis Special Interest Group: http://www.behavioralspeech.com/).

Assess goal progress. Sharing common methods of data collection and assessment of goal mastery can help lead to more effective IFSP and IEP planning and enhance our understanding of child progress. The SLP and behavior analyst may have differing perspectives on a child's progress based on their own methods of data collection. For example, the behavior analyst may see increases in the use of three-word phrases, but the SLP may have concerns regarding flexibility and generalization of these skills. Keeping data on aspects of the child's skill acquisition deemed important by each professional can provide a well-rounded view of the child's progress. Collecting and sharing individual student data will increase mutual respect and understanding of each discipline's intervention plan and progress.

Activity planning. School-based professionals must use their time efficiently because they often support large caseloads of children with a variety of special needs. Identifying activities that most effectively promote skill acquisition and maintenance can be time intensive. Team-based planning that capitalizes on team members' activity successes and challenges will prevent intervention teams from individually "reinventing the wheel" for each student's goals. Teams might maintain a student activity list (that could be housed in the child's classroom), briefly documenting activities that were successful at eliciting behaviors of interest; team members can add to, and borrow from, the list to make the most of each interventionist's time with the child.

Avoid assumptions about intervention methods. One potential barrier to effective collaboration between colleagues may be a misunderstanding about each professional's methods and/or overarching philosophy (Ogletree & Oren, 2001). That is, one should not assume that because a professional subscribes to a particular methodology or intervention approach, that he/she is restricted only to that method. Professionals may (and should) employ a continuum of methods, depending upon the child's individual profile of strengths and challenges. For example, naturalistic ABA-based interventions such as the Early Start Denver Model (Rogers & Dawson, 2009) provide clear decision-making tools for when to increase supports across three areas: reinforcement, structure, and visual supports. If a child is not progressing, based on regular data collection and analysis, the clinician is instructed to add supports moving along the continuum from naturalist teaching all the way to use of massed trial practice and artificial reinforcement (e.g., edibles and unrelated toy/activity) until the child demonstrates learning progress (Rogers & Dawson, 2009). Flexibility is key.

Communicate about the level of intervention supports. In addition to flexibility, it is important to be able to individualize one's approach to each child's pattern of skill acquisition. If a child requires additional supports for one skill, it does not mean that s/he requires that same level of support for all target behaviors. Just as one approach to autism intervention for all children is not advocated, a one-size-fits-all approach to teaching for an individual child does not account for that child's unique profile of strengths and needs. Professionals can assist each other in determining what skills and in which environments a child may require greater or fewer supports. They can also complement each other's intervention methods. For example, a child learning reciprocity might receive support from one professional during a structured board game with peers, whereas another professional might target this during a less structured recess activity.

Recognize team member's training. Each professional on an intervention team serving children with ASD brings a unique set of skills and training to the collective group.

Mutual understanding and respect for this knowledge and training is paramount to successful collaboration. Speech-language pathology certification and licensure requirements reflect their extensive skills and knowledge related to communication and social skills, as well as their rigorous applied training. Many SLPs may have an understanding of the level of training of teachers and other related service providers on the school-based teams. However, given the relatively recent addition of "autism specialists" or behavior analysts to school-based teams, they may not be familiar with the certification process involved in becoming a Board Certified Behavior Analyst (BCBA).

Donaldson (2014) recently described the board certification process for behavior analysts to assist SLPs in understanding the requirements of certification, as well as to provide information for SLPs who may be interested in becoming dually certified. Briefly, BCBA professionals are master's- or doctoral-level service providers who have completed 225 class hours of coursework specific to behavior analysis. They also have completed 750–1,500 supervised practicum hours (based on intensity of supervision), and have passed their Board's national exam (the overall BCBA exam pass rate for 2013 was 53% for 3,006 first-time candidates; www.bacb.com/Downloadfiles/PassRates/BCBA_ACS_pass_rates_alpha.pdf). These professionals are bound by ethical and practice guidelines, and maintain certification through ongoing professional development. For further information regarding the BCBA and assistant level behavior analyst (BCaBA) certification processes, refer to the Behavior Analyst Certification Board (www.bacb.com/index.php?page=53).

Conclusion

SLPs and behavior analysts share common ground, not only in their skills and knowledge, but also in their determination and dedication to supporting children with ASD and their families. Many of the strategies and principles of ABA are already embedded in evidence-based SLP practices, even though the strategies may be known under a different name. The specific training of a behavior analyst and an SLP may complement and supplement each other quite well, and the skills both professionals bring to an interdisciplinary school-based team are essential for serving the varied needs of children with ASD. Working together can lead to improved outcomes for children with ASD served in schools by improving the developmental appropriateness of communication goals and instructions, addressing functional use of these skills, increasing the use of evidence-based strategies, and improving challenging behaviors. Having a basic understanding of each professional's areas of expertise, clinical skills, and goals can improve collaboration and, ultimately, child outcomes.

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